



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

tors, the hyperbolic trapezoids (the parallel sides being parallel to one of the asymptotes, the other two sides being the hyperbolic arc and the other asymptote), but he finds this less general and less convenient. Nowhere, either in eighteenth century or nineteenth century authors have we been able to find a reference to Karsten's geometric construction of imaginary logarithms.

---

## DEPARTMENTS.

---

### SOLUTIONS OF PROBLEMS.

---

#### ALGEBRA.

---

374. Proposed by H. PRIME, Boston, Massachusetts.

Divide an angle of  $30^\circ$  into two parts so that the product of the third and fourth powers of their sines (or cosines) shall be a maximum. To be solved without using the methods of calculus. [From *The Maine Farmers' Almanac*, 1912.]

Solution by H. E. TREFETHEN, Colby College.

Let  $x$  and  $30^\circ - x$  be the two parts.  $\sin^4 x \sin^3 (30^\circ - x) = \text{maximum}$ , when  $\sin^3 x \sin (30^\circ - x) = \text{maximum}$ , or when  $\sin^3 x \cos x - \sin^3 x \frac{1}{\sqrt{3}} = \text{maximum}$ . Put  $\sin^3 x = y$ ,  $\cos x = (1 - y^6)^{\frac{1}{2}}$ ; and then  $y^4 (1 - y^6)^{\frac{1}{2}} - y^7 \frac{1}{\sqrt{3}} = m$ , whence

$$y^{14} - y^8/4 + my^7 \sqrt{3}/2 + m^2/4 = 0 \dots (1).$$

Let  $c$  be a value of  $y$  that renders  $m$  a maximum. Then the first member of (1) must be exactly divisible *twice* by  $y - c$ , since a maximum or minimum corresponds to two equal roots. The quotient is readily written down by the synthetic process. The first remainder  $= c^{14} - c^8/4 + mc^7 \sqrt{3}/2 + m^2/4 = 0$ , since the division must be exact. Also the second remainder  $= 14c^{13} - 2c^7 + 7mc^6 \sqrt{3}/2 = 0$ .

Eliminating  $m$  from the last two equations we get  $196c^{14} - 203c^8 + 16c^2 = 0$ . Whence  $c^2 = 0$  corresponding to a minimum, and  $196c^{12} - 203c^6 + 16 = 0$ ,  $c^6 = y^6 = \sin^2 x = 4.813227/56$ , or  $53.186773/56$ . The former gives  $x = 17^\circ 2' 52.9''$ ; the latter ( $= \cos^2 x$ ) gives  $x = 12^\circ 57' 7.1''$ , and  $30^\circ - x = 12^\circ 57' 7.1''$  or  $17^\circ 2' 52.9''$ .

It is to be noted that this method for determining maxima and minima can be applied to *any algebraic* expression to which the methods of calculus are applicable.

Also solved by J. Scheffer and A. H. Holmes.